WHAT IS CLAIMED IS:

1. In a system in which a boring tool is moved through the ground in a region, an improvement forming part of an arrangement for tracking the position and/or guiding the boring tool using an electromagnetic locating signal which is transmitted from the boring tool as the boring tool moves through the ground, the improvement

at least two detectors located at fixed positions within said region, each being operable in a transmit mode and in a receive mode such that each one of said detectors in the transmit mode is able to transmit a relative locating signal to the other detector for use in determining the relative position of one detector in relation to the other and such that both detectors receive the electromagnetic locating signal in the receive mode for use in determining the position of the boring tool within said region.

2. The improvement according to Claim 1 wherein each detector includes one antenna array for receiving said electromagnetic locating signals and for receiving said relative locating signal.

3. The improvement according to Claim 2 wherein each detector is configured for transmitting said relative locating signal from said antenna array when the detector is in said transmit mode.

4. The improvement according to Claim 3 wherein the antenna array of each detector includes three antennas arranged along three orthogonal axes.

5. The improvement according to Claim 4 wherein the relative locating signal is alternately transmitted from each one of the three orthogonally arranged antennas for receipt by one or more other detectors.

6. The improvement of Claim 1 wherein said detectors receive said electromagnetic locating signal in a predetermined way to produce electromagnetic data in the receive mode and wherein said arrangement includes processing means for using certain information including the electromagnetic data and the relative position established between the detectors to determine the absolute positions of the boring tool and the detectors within said region.

7. The improvement of Claim 6 wherein said detectors include tilt sensors for measuring the tilt angles of each detector in its fixed position such that the tilt angles of each detector form part of said certain information.

8. The improvement of Claim 6 wherein said region includes a cartesian coordinate system having orthogonal x, y and z axes and wherein said processing means is configured for using a distance of one of the detectors from a predetermined one of said axes as part of said certain information.

9. The improvement of Claim 6 wherein said arrangement is configured for receiving said electromagnetic locating signal in said predetermined way by initially using the detectors to receive the electromagnetic locating signal with said boring tool at a first position to produce a first subset of said electromagnetic data and then using the detectors to receive the electromagnetic locating signal with said boring tool at a second position to produce a second subset of said electromagnetic data and, thereafter, said processing means is configured for combining the first and second subsets of electromagnetic data to produce the overall electromagnetic data for use, along with the established relative position between the detectors, in determining the absolute positions of the detectors in said region.

10. The improvement of Claim 6 wherein said system includes a drill rig having an extendable drill string attached to said boring tool such that movement of the boring tool is accomplished by extending or retracting the drill string and the system also includes measurement means for measuring movement of the boring tool based on retraction and extension of said drill string and wherein said arrangement is configured for receiving said electromagnetic locating signal in said predetermined way by initially using the detectors to receive the electromagnetic locating signal with said boring tool at a first position to produce a first subset of said electromagnetic data and then using the detectors to receive the electromagnetic locating signal with said boring tool at a second position to produce a second subset of said electromagnetic data, said first and second positions being separated by a measured distance as determined by said measurement means, and said processing means further being configured for combining the first and second subsets of electromagnetic data to produce the overall electromagnetic data for use, along with the established relative position between the detectors and said certain information, including said measured distance, in determining the absolute positions of the detectors in said region.

11. The improvement of Claim 10 further configured for producing one or more additional subsets of said electromagnetic data at one or more additional positions of said boring tool, said additional subsets of electromagnetic data, thereafter, being used as part of the overall electromagnetic data in a way which improves accuracy in determining the absolute positions of the detectors in said region.

12. The improvement of Claim 1 wherein said detectors are able to receive said electromagnetic signal in said receive mode within a dipole range from said boring tool and are able to receive said relative locating signal within a relative range from a detector that is in said transmit mode and wherein at least one additional detector is positioned in said region such that the additional detector may be out of said dipole range from the boring tool, but is within said relative range of at least a first specific one of the other detectors, the absolute position of which is known in said region, such that with one of either the first specific detector or the additional detector in transmit mode and the other one of either the additional detector or the first specific detector receiving the relative locating signal, the relative position of the additional detector is determinable in relation to the known position of the first specific detector so that, in conjunction with the known position of the first specific detector, the absolute position of the additional receiver is established within said region.

13. The improvement of Claim 12 wherein the additional detector is used in transmit mode and wherein at least said first specific detector and a second specific one of the other detectors are within relative range of the additional detector such that the absolute position of said additional detector in said region is determinable based on the relative signal received by the first and second specific detectors.

14. The improvement of Claim 12 wherein said first specific detector is the farthest detector from said boring tool.

15. The improvement of Claim 12 wherein said first specific detector is used in said transmit mode and the additional receiver receives the relative locating signal.

16. In a system in which a boring tool is moved through the ground in a region, an improvement forming part of an arrangement for tracking the position and/or guiding the boring tool as it moves through the ground using an electromagnetic locating signal which is transmitted from the boring tool, the improvement comprising:

a) a transceiver detector located at one fixed position within said region and configured for transmitting a relative locating signal in a setup mode and for receiving the electromagnetic locating signal in a tracking mode for use in establishing the position of the boring tool; and

b) at least one receiver detector at another fixed position within said region configured for receiving said relative locating signal in said setup mode such that the position of the receiver detector can be established relative to the position of the transceiver detector, based on the relative locating signal and for receiving the electromagnetic locating signal in said tracking mode for use in establishing the position of the boring tool.

17. The improvement according to Claim 16 wherein said transceiver detector includes an antenna array for receiving said electromagnetic locating signal and for transmitting said relative locating signal using said antenna array when the transceiver detector is in said setup mode.

18. The improvement according to Claim 17 wherein the antenna array of said transceiver detector includes three antennas arranged along three orthogonal axes.

19. The improvement according to Claim 18 wherein the relative locating signal is alternately transmitted from each one of the three orthogonally arranged antennas for receipt by one or more other detectors.

20. The improvement of Claim 16 wherein said transceiver detector and said receiver detector are configured for receiving said electromagnetic locating signal in a predetermined way to produce electromagnetic data in said setup mode and wherein said arrangement includes means for using certain information including the electromagnetic data in conjunction with the relative position established between the detectors to determine the absolute positions of the boring tool, the receiver detector and the transceiver detector within said region.

21. The improvement of Claim 20 wherein said transceiver detector and said receiver detector each include a tilt sensor for measuring the tilt angles of the transceiver detector and receiver detector such that the tilt angles form part of said certain information.

22. The improvement of Claim 20 wherein said arrangement is configured for receiving said electromagnetic locating signal in said predetermined way by initially using the transceiver and receiver detectors to receive the electromagnetic locating signal with said boring tool at a first position to produce a first subset of said electromagnetic data and then using the transceiver and receiver detectors to receive the electromagnetic locating signal with said boring tool at a second position to produce a second subset of said electromagnetic data and said processing means further being configured for combining the first and second subsets of electromagnetic data to produce the overall electromagnetic data for use, along with the established relative position between the transceiver and receiver detectors, in determining the absolute positions of the transceiver and receiver detectors in said region without the need for said certain information.

23. The improvement of Claim 20 wherein said system includes a drill rig having an extendable drill string attached to said boring tool such that movement of the boring tool is accomplished by extending or retracting the drill string and the system also includes measurement means for measuring movement of the boring tool based on retraction and extension of said drill string and wherein said arrangement is configured for receiving said electromagnetic locating signal in said predetermined way by initially using the transceiver and receiver detectors to receive the electromagnetic locating signal with said boring tool at a first position to produce a first subset of said electromagnetic data and then using the transceiver and receiver detectors to receive the electromagnetic locating signal with said boring tool at a second position to produce a second subset of said electromagnetic data, said first and second positions being separated by a measured distance as determined by said measurement means, and, thereafter, said processing means being configured for combining the first and second subsets of electromagnetic data to produce the overall electromagnetic data for use, along with the established relative position between the detectors and said certain information, including said measured distance, in determining the absolute positions of the transceiver and receiver detectors in said region.

24. The improvement of Claim 23 further configured for producing one or more additional subsets of said electromagnetic data at one or more additional positions of said boring tool, said additional subsets of electromagnetic data, thereafter, being used as part of the overall electromagnetic data in a way which improves accuracy in determining the absolute positions of the transceiver and receiver detectors in said region.

25. In a system for tracking the position of a boring tool in the ground as the boring tool moves along an underground path which lies within a region, said boring tool including means for transmitting an electromagnetic locating signal and said system including an above ground arrangement for receiving the electromagnetic locating signal for use in establishing the position of the boring tool, a method comprising the steps of:

a) providing at least two above ground detectors as part of said arrangement each of which is configured for receiving said locating signal;

b) locating said detectors at initial positions in said region within a dipole range of said electromagnetic locating signal transmitted from the boring tool at a first, start position;

c) receiving said electromagnetic locating signal using said detectors with said boring tool first at said start position to produce a first set of electromagnetic data;

d) moving the boring tool to a second position;

e) receiving said electromagnetic locating signal using said detectors with said boring tool at said second position to produce a second set of electromagnetic data; and

f) determining absolute positions of the detectors within said region using certain information including said first and second sets of electromagnetic data in a predetermined way.

26. The method according to Claim 25 wherein said detectors include tilt sensors for measuring a tilt orientation of each detector such that the tilt orientation of each detector forms part of said certain information.

27. The method according to Claim 25 wherein said boring tool includes a pitch sensor such that the pitch angle of the boring tool forms part of said certain information.

28. The method according to Claim 25 wherein the electromagnetic locating signal includes a known signal strength which forms part of said certain information.

29. The method according to Claim 25 including the step of measuring a distance between the first and second positions of the boring tool and, thereafter, using said distance as part of said certain information in a way which improves accuracy in determining the absolute positions of the detectors in said region.

30. The method according to Claim 25 wherein said distance is used in a way which overdetermines the absolute receiver positions so as to permit the use of a least square error technique.

31. The method according to Claim 25 wherein said step of receiving said electromagnetic locating signal in said predetermined way further includes the step of producing one or more additional subsets of said electromagnetic data at one or more additional positions of said boring tool, said additional subsets of electromagnetic data, thereafter, being used in determining the absolute positions of the detectors as part of the overall electromagnetic data.

32. The method according to Claim 31 wherein the determination of the absolute positions of said detectors includes an overall certain number of known values and an overall certain number of unknown values and wherein measurements taken at said second position and at each additional position of the boring tool contribute at least one more additional known value to said overall certain number of known values such that the number of overall certain number of known values can be increased relative to the overall number of unknown values.

33. The method according to Claim 32 wherein measurements are taken at a sufficient number of positions such that the overall certain number of known values is equal to or greater than the overall certain number of unknown values so as to use only electromagnetic data in determining the absolute positions of said detectors.

34. The method according to Claim 32 wherein the determination of the absolute positions of said detectors includes the step of using the additional known values in place of at least portions of said certain information.

35. The method according to Claim 34 wherein each detector includes a tilt orientation and wherein the determination of the absolute positions of said detectors includes the step of using the additional known values instead of using measured values of tilt orientation for said detectors such that the tilt values form part of said certain number of unknown values.

36. The method according to Claim 35 wherein said boring tool includes a pitch orientation and wherein the determination of the absolute positions of said detectors includes the step of using the additional known values instead of using a measured value of said pitch such that the pitch orientation forms part of said certain number of unknown values.

37. The method according to Claim 36 wherein said electromagnetic locating signal includes a signal strength and wherein the determination of the absolute positions of said detectors includes the step of using the additional known values instead of using an assumed value of said signal strength such that the signal strength forms part of said certain number of unknown values.

38. The method according to Claim 25 wherein said detectors are able to receive said electromagnetic locating signal within said dipole range of said boring tool and wherein said method further comprises the steps of:

f) after establishing the absolute positions and orientations of said detectors within said region with the detectors at said initial locations within the region, moving the boring tool to a third position such that both detectors remain within said dipole range of the boring tool;

g) establishing the absolute position and orientation of the boring tool at said third position within said region using the detectors at their initial positions;

h) moving said detectors to new positions in said region or providing additional detectors at said new positions within the particular range of said boring tool;

i) receiving said electromagnetic locating signal using the detectors at the new positions with said boring tool at said third position to produce a first subsequent set of electromagnetic data;

j) moving the boring tool to a fourth position;

k) receiving said electromagnetic locating signal using the detectors at the new positions with said boring tool at said fourth position to produce a second subsequent set of electromagnetic data;

l) using certain information including said first and second subsequent sets of electromagnetic data in a predetermined way to determine absolute positions of the detectors at the new positions within said region.

39. The method according to Claim 38 wherein the detectors at the new positions are farther from the start position of the boring tool than at their initial locations such that the boring tool is locatable for a distance beyond said particular range from the start position of the boring tool.

40. In a system for tracking the position of a boring tool in the ground as the boring tool moves along an underground path which lies within a region, said boring tool including means for transmitting an electromagnetic locating signal and said system including an above ground arrangement for receiving the electromagnetic locating signal, an improvement comprising the steps of:

a) providing at least two above ground detectors, each of which is configured for receiving said locating signal;

b) locating said detectors at initial positions in said region within range of said electromagnetic locating signal transmitted from the boring tool at its initial position;

c) providing transmitter means forming one part of at least a first one of said detectors for transmitting a relative locating signal to other detectors in a setup mode;

d) receiving said relative locating signal using a second one of said detectors in said setup mode; and

e) determining the position of the second detector relative to the first detector based on the received relative locating signal.

41. The improvement according to Claim 40 further comprising the steps of:

e) receiving said electromagnetic locating signal in a predetermined way using said first and second detectors to produce electromagnetic data; and

f) establishing initial absolute positions of said detectors and said boring tool within said region using

certain information including the electromagnetic data in conjunction with the relative position established between the detectors.

42. The improvement according to Claim 41 wherein said detectors include tilt sensors for measuring the tilt angles of each detector such that the tilt angles of each detector form part of said certain information.

43. The improvement according to Claim 42 further comprising the steps of:

g) moving one of said detectors to a new, unknown location while the other detector remains in its initial, known position;

h) transmitting said relative locating signal to establish the new location of the moved detector relative to the other detector so as to also establish the absolute position of the moved detector in said region.

44. The improvement according to Claim 43 wherein the moved detector is at least initially out of range of the electromagnetic locating signal at its new location such that a predetermined amount of additional advance of the boring tool causes the moved detector and the other detector to both be in range of said electromagnetic locating signal.

45. The improvement according to Claim 44 wherein the new location of the moved detector is established in proximity to an anticipated drilling path of the boring tool.

46. The improvement according to Claim 44 wherein the moved detector was out of range of the electromagnetic locating signal, prior to being moved from its initial position, as a result of advance of the boring tool and wherein the moved detector is within range of the electromagnetic locating signal, after being moved, such that the moved detector remains within range of the boring tool over a subsequent advance of the boring tool.

47. The improvement according to Claim 44 wherein sufficient additional advance of the boring tool along said anticipated drilling path causes the other detector to be out of range of the electromagnetic locating signal while the moved detector is in range and wherein said improvement further comprises the steps of:

i) moving the other detector to an advance location farther from said boring tool, but still in proximity to said anticipated drilling path;

j) transmitting said relative locating signal to establish the advance location of the other detector relative to the moved detector so as to also establish the absolute position of the other detector at the advance position in said region such that both detectors are again within range of the boring tool to receive the electromagnetic locating signal over further advance of the boring tool.

48. The improvement according to Claim 41 wherein said step of receiving the electromagnetic locating signal in said predetermined way includes the steps of:

measuring said electromagnetic locating signal using the detectors with the boring tool at its first, initial position to produce a first subset of said electromagnetic data;

moving the boring tool to a second position and determining a distance between the first and second positions,

measuring the electromagnetic locating signal with said boring tool at the second position to produce a second subset of said electromagnetic data, and

wherein said step of determining the initial absolute positions of the detectors and the boring tool within said region includes the steps of

combining the first and second subsets of electromagnetic data to produce the overall electromagnetic data, and

determining the absolute positions of the detectors and the boring tool in said region using the overall electromagnetic data in conjunction with the established relative position between the detectors.

49. The improvement according to Claim 41 wherein said system includes a drill rig having an extendable drill string attached to said boring tool such that movement of the boring tool is accomplished by extending or retracting the drill string and wherein said step of receiving the electromagnetic locating signal in said predetermined way includes the steps of:

measuring said electromagnetic locating signal using the detectors with the boring tool at its first, initial position to produce a first subset of said electromagnetic data,

moving the boring tool to a second position and determining a distance between the first and second positions,

measuring the electromagnetic locating signal with said boring tool at the second position to produce a second subset of said electromagnetic data, and

wherein said step of determining the initial absolute positions of the detectors and the boring tool within said region includes the steps of

combining the first and second subsets of electromagnetic data to produce the overall electromagnetic data, and

determining the absolute positions of the detectors and the boring tool in said region using the overall electromagnetic data, along with the established relative position between the detectors and said distance measured between the first and second positions of the boring tool, in determining the absolute positions of the detectors in said region.

50. The improvement according to Claim 49 wherein said step of receiving said electromagnetic locating signal in said predetermined way further includes the step of producing one or more additional subsets of said electromagnetic data at one or more additional positions of said boring tool, said additional subsets of electromagnetic data, thereafter, being used in said absolute position determining step as part of the overall electromagnetic data in a way which improves accuracy in determining the absolute positions of the detectors and the boring tool in said region.

51. In a system for tracking the position of a boring tool in the ground as the boring tool moves along an underground path which lies within a region, said boring tool including means for transmitting an electromagnetic locating signal and said system including an above ground arrangement for receiving the electromagnetic locating signal within a dipole range of the boring tool, an improvement in establishing an intended path for said boring tool within said region, the improvement comprising the steps of:

a) providing at least two detectors as part of said above ground arrangement, each detector being configured for receiving the electromagnetic locating signal;

b) with the boring tool at a start position, locating the above ground detectors at initial fixed positions within said dipole range of said boring tool in an initial portion of said region for receiving the electromagnetic locating

signal as the boring tool is later guided along an initial segment of the intended path within said dipole range of said boring tool;

c) establishing absolute positions of said detectors within the initial portion of said region;

d) mapping the initial segment of said intended path through the initial portion of said region in a particular way using said detectors;

e) moving the detectors in a predetermined way to new locations within an adjacent, new portion of said region including an adjacent, new segment of said intended path; and

f) without moving the boring tool from its start position, mapping the new segment of the intended path in said particular way through the new portion of said region through which the boring tool will later pass after having passed through the initial portion of the region.

52. The improvement according to Claim 51 further comprising the step of:

f) repeating steps (d) and (e) in an iterative manner for additional new segments of said intended path until a complete intended mapped path is established for the boring tool through said region, including segments of said intended path which are out of range of the dipole signal with the boring tool remaining at said start position.

53. The improvement according to Claim 52 wherein the segments of the intended path are mapped in said particular way by (i) providing a mapping tool which is configured for transmitting a mapping signal to said detectors, (ii) positioning the detectors within one portion of the region undergoing mapping and corresponding to a particular segment of said intended path, (iii) positioning the mapping tool on or above the ground at a plurality of above ground points corresponding to the intended path for the particular segment while transmitting the mapping signal from each above ground point to the detectors in a way which establishes the absolute position of each above ground point and, thereby, establishes the absolute position of a corresponding point along the intended path of the boring tool in the particular segment.

54. The improvement according to Claim 51 wherein the step of establishing absolute positions of the detectors within the initial portion of said region includes the steps of transmitting the electromagnetic locating signal from the boring tool at its start position and receiving the electromagnetic locating signal using the detectors to produce electromagnetic data and, thereafter, using information including the electromagnetic data establishing the absolute positions of said detectors within said region.

55. The improvement according to Claim 51 wherein at least one of said detectors includes means for transmitting a relative locating signal and the other detector is configured for receiving the relative locating signal and wherein the step of moving the detectors in said predetermined way includes the steps of (i) moving a first one the detectors to a first new location in the new portion of said region while the other detector remains in its initial, known position, and (ii) transmitting said relative locating signal between the detectors for use in establishing the first new location of the first detector so as to also establish the absolute position of the first detector at said first new location in the new portion of the region.

56. The improvement according to Claim 55 wherein the relative locating signal includes a maximum transmission distance between the detectors such that each segment of the intended path includes a length which is determined by said maximum transmission distance.

57. The improvement according to Claim 55 wherein the step of moving the detectors in said predetermined way further includes the steps of (i) moving the second one of the detectors to a second new location in the new portion of said region such that both detectors are in the new portion of the region and, thereafter, (ii) transmitting said relative locating signal between the detectors for use in establishing the second new location of the second detector so as to also establish the absolute position of the second detector in the new portion of the region without the need to move the boring tool.

58. In a system for tracking the position of a boring tool in the ground as the boring tool moves along an underground path which lies within a region, said boring tool including means for transmitting an electromagnetic locating signal and said system including an above ground arrangement for receiving the electromagnetic locating signal for use in establishing the position of the boring tool, a method comprising the steps of

a) providing an above ground detector as part of said arrangement which is configured for receiving said locating signal;

b) locating the detector at an initial position in said region within a dipole range of said electromagnetic locating signal transmitted from the boring tool at a first, start position;

c) receiving said electromagnetic locating signal using said detector with said boring tool first at said start position to produce a first set of electromagnetic data;

d) moving the boring tool to a second position;

e) receiving said electromagnetic locating signal using said detector with said boring tool at said second position to produce a second set of electromagnetic data; and

f) determining absolute positions of the detector and the boring tool within said region using certain information including said first and second sets of electromagnetic data in a predetermined way.

59. The method according to Claim 58 including the step of measuring a distance between the first and second positions of the boring tool and, thereafter, using said distance as part of said certain information in determining the absolute positions of the detector and boring tool in said region.

60. The method according to Claim 58 wherein said certain information includes a lateral offset of the detector from an intended path of the boring tool and pitch of the boring tool at said first and second positions.

61. In a system in which a boring tool is moved through the ground having a pitch orientation in a region, an improvement for steering the boring tool using an electromagnetic locating signal which is transmitted from the boring tool as the boring tool moves through the ground, the improvement comprising the steps of:

a) establishing a target location towards which the boring tool is to be steered;

b) selecting a flux pathline having a pathline slope and extending between the boring tool and the target location by specifying a selected pitch orientation for the boring tool upon reaching the target location, the selected flux pathline defining a plane in said region; and

c) guiding the boring tool along the selected flux pathline to the target location such that a particular ratio between a vertical component of the locating field measured within the plane of the selected flux pathline and a horizontal component of the locating field measured within the plane of the selected path flux line is present at said target location which particular ratio is equal to the specified pitch orientation of the boring tool at the target location.

62. The improvement of Claim 61 wherein the step of guiding the boring tool includes the step of measuring values of the locating signal at an above ground location and determining steering commands to the target location based on deviation of the ratio of the vertical and horizontal components from the particular ratio.

63. The improvement of Claim 61 wherein said target location is in-ground and wherein said guiding step is performed using locating field measurements obtained at an above ground location in remote proximity to said target location.

64. The improvement of Claim 61 wherein said target location is above ground such that said guiding step is performed using locating signal measurements obtained substantially at the target location.

65. In a system in which a boring tool is moved through the ground having a pitch orientation in a region, an improvement for steering the boring tool towards a target location using an electromagnetic locating signal which is transmitted from the boring tool as the boring tool moves through the ground, the improvement comprising:

an arrangement for specifying a selected pitch orientation for the boring tool upon reaching the target location and for selecting a flux pathline extending between the boring tool and the target location to define a plane, based on said selected pitch orientation, such that a particular ratio between a vertical component of the locating field in a vertical direction measured in said plane and a horizontal component of the locating field in a horizontal direction measured in said plane is present at said target location which is equal to the specified pitch orientation of the boring tool at the target location as the boring tool is guided along the selected flux pathline to the target location.

66. The improvement of Claim 65 wherein said arrangement includes means for measuring values of said locating signal at an above ground location and for determining steering commands based on deviation of the ratio of the vertical and horizontal components of the locating field at the target location from the particular ratio.

67. The improvement of Claim 65 wherein said target location is in-ground and wherein said arrangement includes means for measuring values of said locating signal at an above ground location in proximity to the target location for use in guiding the boring tool along the selected flux pathline.

68. The improvement of Claim 65 wherein said target location is above ground and wherein said arrangement includes means for measuring values of said locating signal substantially at the target location for use in guiding the boring tool along the selected flux pathline to the target location.

69. In a system in which a boring tool is moved through the ground having a pitch orientation in a region, an improvement for steering the boring tool using an electromagnetic locating signal which is transmitted from the boring tool as the boring tool moves through the ground, the improvement comprising the steps of:

a) establishing a target location towards which the boring tool is to be steered;

b) selecting a flux pathline having a pathline slope and extending between the boring tool and the target location by specifying a selected pitch orientation for the boring tool upon reaching the target location, the selected flux pathline defining a plane in said

c) guiding the boring tool with respect to vertical positioning along the selected flux pathline to the target location such that a particular ratio between a vertical component of the locating field in a vertical direction within said plane and a horizontal component of the locating field in a horizontal direction within said plane is present at said target location which is equal to the specified pitch orientation of the boring tool at the target location while, at the same time, guiding the boring tool along the selected flux pathline with respect to horizontal positioning based on a measured intensity of the locating signal normal to said plane.

70. The improvement of Claim 69 wherein the measured intensity of the locating signal normal to said plane approaches zero when the boring tool is on the selected flux pathline.